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(54) THE BROADCASTING PROGRAM APPARATUS FOR RESTRICTING BROADCASTING CHANNEL WATCH USING THE FACE RECOGNITION.

Abstract

Machine Translation   Human Translation

1. The present invention relates to the broadcasting program apparatus for restricting broadcasting channel watch of the digital television the face recognition is used, in which the apparatus of the present invention includes the control means which when the broadcasting program is compared with the set viewing limit rating the member face identification mean generated around confirmation result, it identifies the identity of ***, based on the recognized feature as described above in response to the broadcasting program viewing limitation acknowldegement signal, and the viewing rating detected from the broadcasting program the feature of the face of each member for to watching is recognized, is generated the broadcasting program viewing limitation acknowldegement signal, and controls the means decoding the broadcasting program according to the recognition result generated from the face identification mean to the broadcasting program canning be seen and listened to the enable or the disable state. Therefore, it is convenient in comparision with the mode performing the viewing limitation with the password of the prior art and the selective viewing limitation of the broadcasting program which is the automatic is possible.

Machine Translation   Human Translation

PURPOSE: An apparatus for blocking broadcasting program watching using face recognition is provided to block user from

watching television selectively according to user's face.

CONSTITUTION: An apparatus for blocking broadcasting program witching using face recognition includes a decoder, a recognizer(100), and a controller(30). The decoder encodes a bit stream from the broadcasting program and detects the level accompanied by the bit stream of watching. The recognizer(100) recognizes characteristics of members, and generated recognized result with identification of the member. The controller(30) generates an acknowledge signal and controls the decoder in an enable and a disable status according to the recognition result generated the face recognizer(100).

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▶ Representative Drawing(s)

Fig. 1

© Descritption

◆ Brief explanation of the drawing

2   Fig. 1 is a summary block diagram of the broadcasting program apparatus for restricting broadcasting channel watch using the face recognition comprised according to the preferred embodiment of the present invention

3   Fig. 2 is a detail block diagram of the face recognition part exemplified in
Fig. 1

4   Fig. 3 is a drawing illustrating the feature vector which the feature vector extractor exemplified in
Fig. 2 is extracted by the feature vector extractor.

5   ☐The description of reference numerals of the main elements in drawings☐

6   10: tuner / demodeulator 20: MPEG decoder.

7   30: television controller 100: face recognition part.

8   110: feature vector extractor 140: neuro circuit network.

◆ Details of the Invention

▶ Purpose of the Invention

The Technical Field to which the Invention Belongs and the Prior Art in that Filed

9   The present invention relates to the broadcasting program method for restricting seeing of the digital television, more particularly, to the method for selectively limiting the audition of the broadcasting program of the digital television by using the face recognition.

10   The various program is provided with the power generation of a media. And it thus goes and the video program which is harmful to a minor deluges like the lascivious stuff, the violence, and the broadcast water of the low-class. Many method for to protecting a minor and teenager from the hamful broadcasting program is proposed. One of the middle has the method for fundamentally blocking the regeneration or the broadcasted program by using a password in the broadcast media, that is, the video cassette recorder and television. But there is a problem that of memorizing a password only two mans as long as the method using this kind of a password has the authority interrupting the harmfulness program among the member of the unit of in case of possibly forgeting a password.

11   There can be the method for seeking out the language relating to the lewdness and brute force at the broadcasting system from the provided broadcasting program and blocking the broadcasting program in which this language is included in advance as the other method for the broadcasting program viewing limitation. But it is impossible to this method be exact, seek out the harmfulness broadcasting program. And the perfect program for this is not yet generalized.

Technical challenges of the Invention

12   Therefore, an object of the present invention is to provide the method for selectively limiting the city hall through the face recognition of the broadcasting program viewer of the digital television.

13   The broadcasting program apparatus for restricting broadcasting channel watch of the digital television using the face recognition for achieving the above-described purpose is generated the broadcasting program viewing limitation acknowldegement signal. It is done by a feature to include the control means controlling the decoding means according to the confirmation result generated from the face identification mean to the enable or the disable state compared to the set viewing limit rating the viewing rating which decodes the bit stream of the broadcasting program and it outputs to the form canning be seen and listened, and it recognizes the feature of the face of the decoding means: each member for to watching the broadcasting program, and detects the broadcasting program viewing rating accompanied with the bit stream is detected in response to the broadcasting program viewing limitation acknowldegement signal based on the recognized feature as described above with the member face identification mean generated around confirmation result, it identifies the identity of ***: decoding means.

▸ Structure & Operation of the Invention

14   Hereinafter, the attached embodiment of the present invention is done, concretely it illustrates.

15   Referring to
Fig. 1, according to the present invention, it is the summary block diagram of the digital television for the broadcasting program viewing limitation using the comprised face recognition. The tuner / demodeulator (10), MPEG decoder (20), television controller (30), display (50), face image acquisition part (60) and face recognition part (100) are included.

16   As shown in
Fig. 1, the bit stream of the digital broadcast signal broadcasted from the broadcast station is applied to the tailoring / demodeulator (10) of the digital television. The bit stream includes the class signal showing the class of not only the content information but also this program including the air-time of the broadcasting program, a version, the channel information etc. The program grade which this class signal shows shows the unable to look and listen age excluded.

17   After the tuner / demodeulator (10) tunes the bit stream of the channel corresponding to the tuning control signal of the television controller (30) among the bit stream of the digital broadcast signal received through an antenna, it again demodulates this and it provides to the MPEG decoder (20). And it detects with moreover, the program grade and it provides this to the television controller (30).

18   After separating the provided broadcast signal according to the audio signal, the video signal and various kinds program information from the tuner / demodeulator (10) and decoding, it converts the digital video signal of the frame unit decoded through the signal processing unit (not illustrated) into NTSC or the PAL signal and it displays in the display (50). And it converts the decoded digital audio signal into the analog signal and it outputs from the MPEG decoder (20) to the speaker (it is not shown).

19   The television controller (30) performs the function of controlling all elements comprising the digital television. And it determines whether it can watch the broadcasting program in which the viewer watching the television in connection with the face recognition part (100) explained in following is received and or not it selectively controls the MPEG decoder (30). In that way the decoded broadcasting program is not outputted in the display (50). It more circumstantially refers to. The television controller (30) compares the program grade provided from the tuner / demodeulator (10) with the set viewing limit rating. If the comparison result, and the program grade are identical with the set viewing limit rating, the viewing limitation acknowldegement signal in which the viewer for to watching the received broadcasting program judges whether it is the viewer of the viewing limitation age or not is outputted to the face recognition part (100).

20   In the television front in response to the viewing limitation acknowldegement signal, delivered from the controller (30), the face recognition part (100) determines the viewer faking the television or watches whether it is the viewer of the visible or *** available age group through the face recognition. It informs by the controller (30) in the determination ***. In that way in order not to be outputted in the MPEG decoder (20) to the display (50) the program received to the controller (30) controls.

21   In
Fig. 2, the detail block diagram of the face recognition part (100) is exemplified. The face recognition part (100) provides the feature vector extractor (110), the hidden Markov model parameter generation part (120), and the conditional probability calculation unit (130) neuro circuit network (150). Firstly, for example, the face recognition part (100) one family member each single person recognizes clearly the face as the viewer group. Therefore, the face recognition part (100) acquires the face image of a member within the viewer group which is acknowleged by using the face image acquisition part (60) exemplified in
Fig. 1. It performs the process of remembering the feature about the obtained face image.

22   For example, the face image acquisition part (60) acquires the face image about each member within the viewer group by using the CCD camera (not illustrated) etc. In order to remove the dust or the noises of the camera lens, the median filter consisting of the low pass filter is used in an image-acquisition.

23   The face image obtained with the face image acquisition part (60) per a member is provided to the feature vector extractor (110) of the face recognition part (100). As to the embodiment of below the present invention, it assumes that it is 10 field and the number of face image which one family member is obtained with 10 people, and each man per are explained. If only the number of object acknowleged in connection with thises, and the number of face image per each objects and number of feature vector explained in followings are sufficient because of cultivating the neuro circuit network (150), although it is any number, it has no concern.

24   The feature vector extractor (110) extracts the edge face image (200) like being exemplified with the set edge detection technique in
Fig. 3. It produces the feature vector. The edge face image (20) illustrated in
Fig. 3 includes binocular (212 and 214), and the nose (216) and mouth (218), where the feature vector is based on these and it is generated. The feature vector has with the element of 5 a , that is, [F1, F2, F3, F4, F5] = [a/f, b/f, c/f, d/f, e/f]. Here, "a" is the diagonal length between the bottom plane intermediate point of the bottom plane intermediate point of the left eye (212) and the nose (216) and "b" is the diagonal length between the bottom plane intermediate point of the bottom plane intermediate point of the right eye (214) and the nose (216) and "c" is the vertical length between the upper side intermediate point of the bottom plane

intermediate point of the nose (216) and the mouth (218) and "d" is the vertical length between the bottom plane intermediate point of the bottom plane intermediate point of the right eye (214) and the nose (216) and "e" is the length of an interval that the horizontal line from the left side intermediate point of the mouth (218) and point meet with the contour line of the face image (200) and "f" is the horizontal length between the left side intermediate point of the right side intermediate point of the left eye (212) and the right eye (214). In "a", by being divided into "f" and being normalized the element of 5 to "e"s are prescribed as the feature vector $(O_v = O_1, O_2, O_3, O_4, O_5)$.

25 As shown in the feature vector (O_v) is exemplified in the diagram below 1, as described above, it has the face image of 10 field at 10 name a member. Therefore, it has 5 the sick feature vector at the face image of each member. Therefore, in the face image of 10 field per each member, it has the feature vector of 50 totals. Therefore, it has the feature vector of 500 totals about the member of the whole 10 people.

Table 1

Object	Face image	Feature vector	Model parameter
	An image 1	$O_{v,1} = O_1, O_2, O_3, O_4, O_5$	
A member 1	.	.	λ_1
	An image 10	$O_{v,20} = O_1, O_2, O_3, O_4, O_5$	
.	.	.	.
.	.	.	.
.	.	.	.
	An image 1	$O_{v,1} = O_1, O_2, O_3, O_4, O_5$	
A member 10	.	.	λ_{10}
	An image 10	$O_{v,20} = O_1, O_2, O_3, O_4, O_5$	

26 As been exemplified in the above-described table 1, the feature vector (O_v) of 250 about the face image of 5 field is provided among the face image which the feature vector extractor (20) is extracted by the feature vector extractor (20) of 10 field per each member to the hidden Markov model parameter generation part (120). The feature vector provided to the hidden Markov model parameter generation part (120) is used as training data.

27 As the statistical model showing a signal in the stochastic process (doubly stochastic process) of the double, the hidden Markov model used in the present invention can show in the state sequence $s_1, s_2, \ldots, s_T$ which is the continuation column $O_1, O_2, \ldots, O_T$ which is called because of being the observation heat and the part which hide (hidden)s of a feature. As to the hidden Markov model, in each transition as the assembly of the states connected by the transition, the probability of 2 kinds relates. One is the transition probability in which the current transition is made. When a transition was made, the other one is the probability prescribing the conditional probability in which each output symbol is observed from the observation object of the Yu HanGae.

28 The state number is N. The observation number of symbols is M. It is the status set $Q = [q_1, q_2, \ldots, q_N]$. It is the symbol combination generation $V = [v_1, v_2, \ldots, v_M]$. This hidden Markov model can be defined as the model parameter (λ) like below equation 3 when being the length $t = 1$ of the observation string, 2, and the $\ldots, \Gamma$.

Mathematical Formula 3

29    $\lambda = (A, B, \pi)$

30   In the above-described equation 3, the variable A/6 the t number observation symbol-serial is in the state q_i. It is the state transition probability in which a t+1 the observation symbol-serial selects the state q_j. The variable B/6 is the observation symbol probability in which the t number observation symbol-serial selects the symbol v_k in the state q_i state than. The variable π is the initial state probability selecting the state q_j in the initial state than. It is respectively defined like 6 through below Equation 4.

Mathematical Formula 4

31    $A = \Box a_{ij} \Box$, $a_{ij} = Pr(q_j \text{ at } t+1, q_i \text{ at } t)$

Mathematical Formula 5

32    $B = \Box b_j(k) \Box$, $b_j(k) = Pr(v_k \text{ at } t, q_j \text{ at } t)$

Mathematical Formula 6

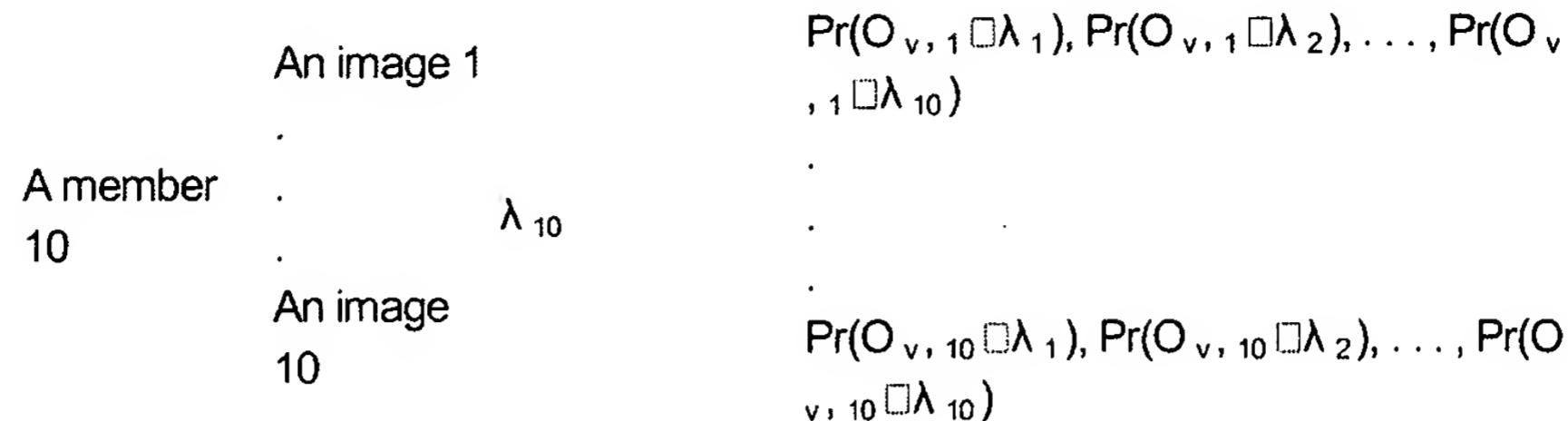33 $\pi = \Box \pi_i \Box$, $\pi_i = Pr(q_j \text{ at } t=1)$

34   According to the present invention, in the hidden Markov model, five feature vector O_vs were used as the length of the observation string. And the state number was to 4. And the available number of a churn produced the model parameter by using 2 persons the left-to-right model.

35   Therefore, the hidden Markov model parameter generation part (30) is disciplined that it receives the feature vector O_v of 5 the sick per each face image of 5 field per one member and it produces the model parameter (λ) collected strictly to the most small value. Consequently, the model parameter (λ_i) collected strictly to the most small value of one per one man is generated. And as shown in table 1, the above-described model parameter ($\lambda_i = \lambda_1, \lambda_2, \lambda_3, \dots, \lambda_{10}$) of 10 totals is generated.

36   As to the next, and the conditional probability generating unit (130), by using the feature vector toward each member of the half elated by being exemplified in the model parameter ($\lambda_i = \lambda_1, \lambda_2, \lambda_3, \dots, \lambda_{10}$) of 10 and the table 1 collected strictly, it saves with the conditional probability , Pr (O□λ) of the feature vector O_v about each member, and . This conditional probability outputs the member having the large probability value about each member to the recognition result. It is the same like the bar exemplified in the diagram below 2.

Table 2

Object	Face image	Model parameter	Conditional probability
	An image 1		$Pr(O_{v,1} \Box \lambda_1), Pr(O_{v,1} \Box \lambda_2), \dots, Pr(O_{v,1} \Box \lambda_{10})$
A member 1 .	.	λ_1	.
	.		.
	An image 10		$Pr(O_{v,10} \Box \lambda_1), Pr(O_{v,10} \Box \lambda_2), \dots, Pr(O_{v,10} \Box \lambda_{10})$

	An image 1	$Pr(O_{v,1} \square \lambda_1), Pr(O_{v,1} \square \lambda_2), \ldots, Pr(O_{v,1} \square \lambda_{10})$
A member 10	. λ_{10} .	.
	An image 10	$Pr(O_{v,10} \square \lambda_1), Pr(O_{v,10} \square \lambda_2), \ldots, Pr(O_{v,10} \square \lambda_{10})$

37   The conditional probability saved about above-described each member finds due to the conditional probability value of 100 per each member. Among these, the conditional probability value of the half per each member is applied to the neuro circuit network (150) of the next stage. The conditional probability value of the half applied as the neuro circuit network (150) is used as data cultivating the neuro circuit network (150). And in order to test the learned neuro circuit network (150), the conditional probability value of the rest half stores in an inside.

38   The neuro circuit network (150) is comprised of widely, as is well known, the input layer, and the hidden layer and output layer. In the present invention, the number of input node of the neuro circuit networks (150) is comprised of 10 as the number of conditional probability value provided from the conditional probability generating units (130) and number of output node is the same member it is 100s. The neuro circuit network (150) is disciplined in the conditional probability generating unit (130) based on the provided probability value. In that way with being generated the second number, that is, "0" in the ith output node in the first value, that is, "1" and ith output node the other output node it is learned. The learning of the neuro circuit network (40) is performed by using the normal learning algorithm, for example, the error back propagation algorithm.

39   Next, the conditional probability stored in the conditional probability generating unit (130) is inputted and an object, that is, viewers are successively acknowleged as the neuro circuit network (150) based on the recognition result of the neuro circuit network (150).

40   Again, referring to
Fig. 1, in the controller (30) of the digital television, if the viewing limit rating included in the broadcasting program is analyzed and it is the broadcasting program viewing limitation acknowldegement signal provided to the face recognition part (100), the audition magnetic charge the face image of the recognition object is the television obtained in the face image acquisition unit (60). If the feature vector in which the feature vector extractor (110) is extracted by the feature vector extractor (110) is applied to the face recognition part (100), it is not put through the hidden Markov model parameter generation part (120) of the face recognition part (100) and the feature vector is directly inputted to the conditional probability generating unit (130). The conditional probability generating unit (130) produces the conditional probability the feature vector by using the hidden Markov model. Next, it is inputted to the neuro circuit network (150) in which the generated conditional probability is learned. As to the neuro circuit network (150), the man corresponding to the feature vector produces the output which shows whether it is acknowleged as any kind of man among 10 people or not.

‣ Effects of the Invention

41   As described above, and the audition of the broadcasting program viewer is automatically selectively enforced by using the face recognition. In that way the member having the specific privilege on the broadcasting program viewing limitation like a convention does not need to worry about the forgetfulness of a password. A password Sookgi is not stubbornly done about to a need.

⊜ Scope of Claims

Claim[1] :

42 The broadcasting program apparatus for restricting broadcasting channel watch of the digital television that uses the face recognition, said broadcasting program apparatus for restricting broadcasting channel watch of the digital television is comprised of the control means which is generated the broadcasting program viewing limitation acknowldegement signal; and controls the decoding means according to the recognition result generated from the face identification mean to the enable or the disable state.

Claim[2] :

46 The face identification mean as to claim 1 :

47 The broadcasting program apparatus for restricting broadcasting channel watch that uses the face recognition, broadcasting program apparatus for restricting broadcasting channel watch comprising: the neuro circuit network identifying the identity corresponding to the feature vector of the recognition object according to the result which is learned by using the feature vector of the camera: feature vector extractor: each member extracting the feature vector from the face of the member obtained from a camera acquires the face image of the recognition object for to watching the outputted broadcasting program with the decoding means and provides the recognition result concerning to the control means.

Claim[3] :

50 The face identification mean as to claim 2 :

51 The broadcasting program apparatus for restricting broadcasting channel watch using the face recognition which more includes the hidden Markov model parameter generation part: conditional probability generating unit which cultivates the neuro circuit network by it produces the conditional probability of the feature vector by using the feature vector of each member and the hidden Markov model parameter generated from the hidden Markov model generating part and providing for the neuro circuit network, produces the hidden Markov model parameter which has the most small convergence value by being disciplined by using the feature vector of each member.

비트 스트림

튜너/복조부 10

MPEG 디코더 20

텔레비전 제어부 30

디스플레이 50

� 인식부 100

엔코음성 출력부 60

음성영상 취득부
(60)으로 부터

110
특징벡터
추출부

120
음의 마르코프
모델 파라미터
생성부

130
조건부
확률
생성부

150
신경 회로망

텔레비전
제어부
(30)으로